DOCUMENT RESUME

ED 085 115 PS 007 037

AUTHOR	Tarte, Robert D.
TITLE	Barpressing in the Presence of Free Rewards in Humans.
INSTITUTION	Nevada Univ., Las Vegas. Dept. of Psychology.
PUB DATE	[72]
NOTE	20p.; Not available in hard copy due to marginal legibility of original document
EDRS PRICE	MF-$0.65 HC Not Available from EDRS.
DESCRIPTORS	*Adolescents; Age Differences; Behavior Development; *Behavior Patterns; *College Students; *Preschool Children; Racial Differences; *Self Reward; Sex Differences
IDENTIFIERS	California Psychological Inventory; *Choice

ABSTRACT

Five studies are reported which examine the free vs. earned reward phenomenon in humans. The 420 subjects were distributed over all grade levels from preschool through college. Candies and coins were used as rewards. In preschool through sixth grade groups, black, as well as white subjects and experimenters were used. The California Psychological Inventory was administered to the college students. In all experiments, subjects had the choice of obtaining rewards one at a time, either by pushing a lever or choosing freely from a filled dish. There was a great preference for obtaining rewards by bar pressing. The preference decreases from nearly 100 percent to about 50 percent as subjects increased in age. No significant differences were found for type of rewards, sex, or race of subject and experimenter, except that males bar pressed significantly more than females in the college group. Two scales of the CPI correlated significantly with bar pressing. (Author/SET)

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BARPRESSING IN THE PRESENCE OF FREE REWARDS IN HUMANS

Robert D. Tarte

Abstract

Five studies are reported which examine the free vs. earned reward phenomenon in humans. The 420 Ss were distributed over all grade-levels from preschool through college. Candies and coins were used as rewards. In preschool through sixth-grade groups, black, as well as white, Ss and Es were used. The California Psychological Inventory was administered to the college students. In all experiments, Ss had the choice of obtaining rewards one at a time, either by pushing a lever or freely from a filled dish. There was a great preference for obtaining rewards by bar pressing. The preference decreased from nearly 100% to about 50% as Ss increased in age. No significant differences were found for type of rewards, or sex or race of S and E, except for males bar pressing significantly more than females in the college group. Two scales of the CPI correlated significantly with bar pressing.

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BARPRESSING IN THE PRESENCE OF FREE REWARDS IN HUMANS[1]

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It has been well-documented that rats and pigeons prefer to earn rewards to receiving them freely, at least under certain conditions. Hungry rats prefer to bar press for single food pellets over taking them freely from a filled dish, when they have had massed, reinforced bar press training before the choice situation (Jensen, 1963; Carder and Berkowitz, 1970; Tarte and Snyder, 1972). Further, pigeons will work for food in the presence of free food, when the animals live in operant chambers and are not food deprived (Neuringer, 1969, 1970).

Two published studies have examined the phenomenon in children. Singh (1970) tested 60 children, aged 65-81 months, using a device with which the Ss could obtain marbles at one end by operating a lever (On a FR-10 schedule) or at the other end freely, at the same rate as the marbles had been earned during training. The children took significantly more marbles by bar pressing than freely; about two-thirds of the marbles were obtained via bar pressing. Singh found no significant correlations with either sex or IQ and the bar pressing phenomenon. Singh and Query (1971) also tested 40 white and 40 American Indian children on the apparatus. Both groups obtained significantly more marbles by working (again about two-thirds of the marbles), but Singh found no significant relationship between I.Q., need for achievement, cultural, or sex differences and bar pressing.

PS 007 623

Five experiments are reported here which were conducted to

further examine the phenomenon in humans.

Experiment 1

The first experiment was conducted in order: 1) to see if children prefer to operate a manipulandum to secure rewards rather than take them freely in a situation more analagous to reported animal studies; and 2) to examine any differences in responding over age-grades.

Method. White children at an upper-middle class white preschool and elementary school were run by a female E. Twelve children were run from each of eight grade levels: preschool, kindergarten, and first- through sixth-grades. Each grade level was randomly divided into three subgroups of four Ss each, 2 boys and 2 girls, run under three different conditions. In this study, and in all others reported here, the apparatus used was a Lindsley Manipulandum (Gerbrands G 6310) and a Universal Dispenser (Gerbrands G 5970), housed in a wooden box 38 X 28 X 122 cm high. Each S was seated in front of the apparatus. On each trial a reward could be obtained by pushing the lever in, or by taking the reward from a free-dish situated next to the machine. The lever was modified so that it pushed very easily. Four-year-old children had no difficulties operating it. The position of the free dish was alternated, so that it was to the right of the apparatus on one-half of the children, left for one-half. Each child was told that he could obtain a reward by pushing the bar, or by taking one from the dish, and that he had his choice on each trial. The instructions for this and the subsequent four experiments were as follows:

You can get candies (pennies, nickels) either by taking them one at a time from this dish, or by getting one at a time by pushing-in this lever (E demonstrates). No matter how you choose to get the candies (pennies, nickels), you will get just as many. For each candy (pennies, nickels), then, you must decide which way to get it. I will stop you when you have gotten all the candies (pennies, nickels) you are allowed. Do you understand. (Repeat the instructions if necessary).

The E demonstrated once how the apparatus worked. Group 1 could obtain a total of 50 M&M candies. These children were given no instructions as to what to do with the candies. Group 2 could obtain 20 M&M's, but they were told that they must each each candy as it was obtained. All children in Group 2 managed to eat 20 candies. In Group 3, each S obtained a total of 25 pennies. All children were run between 9:00 a.m. and 11:00 a.m.

Results. The results of the three experiments in the first study are shown in Table 1. The most striking result in all three experiments was the extremely high preference by the children for lever-pressing for the rewards over taking them from the dish. In fact, all grade-level groups in the study obtained over 50% of the reinforcements via the lever, for an overall mean of 77%. As can be seen in Table 1, the percentages of bar pressing for the three experiments were 83%, 73% and 69% respectively.

Insert Table 1 about here

Interestingly, the results obtained in Condition 3 with

kindergarten Ss, ages 5 and 6 years, are almost identical to the results Singh obtained with his Ss (ages 65-81 months). Singh reported a 63% mean preference for working to obtain marbles, used as tokens, and in the present study, the kindergarten Ss, with pennies as rewards, showed a 62% mean preference for working for the rewards.

There were very high preferences for lever-pushing in the extreme grade-levels used, preschool and sixth-grade, 94% and 92% respectively. A three-way analysis of variance was applied using grade-levels, experiments and sex as variables. The only significant results was for grade-level ($F=3.21$, $df=7/60$, $p<.01$). Therefore, a Newman-Keuls test was applied to the data of the eight grade-levels. The test showed that the third-grade was significantly different from the sixth-grade at less than the .01 level, and the third-grade was different from preschool, second-and fifth-grades at less than the .05 level of significance. The number of third-graders was doubled, yielding the same low percentages of preference for lever pushing (around 50%). The children in the other age-grade groups showed intense curiosity about the apparatus; the younger Ss seemed to regard it as a "magic machine", and the older children were curious as to how it worked. The third-graders, on the other hand, were timid about the experiment, and, in fact, wanted to leave as soon as possible. In most cases, the third-graders would alternate between the free rewards and lever pushing, a pattern of responding not found in other age-grades. In general, older children completed the experiment faster than younger children. The total

range was from one to twelve minutes.

Two children, at each grade-level were selected for an extension study which was like Condition 1, except that the Ss were not stopped until they had obtained 150 candies. The resulting mean percentages of lever pushing were at the same levels as in Condition 1, indicating that the preference did not change when many trials (and many reinforcements) were available.

Experiment 2

Experiment 2 was conducted to see if black children from a lower socio-economic class would exhibit different responding behaviors from the white children.

Method. The second experiment was conducted using lower class black children in a segrated, all-black elementary school. The Ss were randomly assigned to one of four groups: two groups were run by a black, female E, one obtaining 25 M&M candies as rewards and the other 25 pennies. The other two groups were the same, except that they were run by a white, female E. Grades K through 6 were used, with 2 boys and 2 girls as Ss at each grade-level in each group, 112 Ss in all. Note that preschool children were not used in this study, due to a lack of an appropriate facility. The procedure was the same as that of Experiment 1.

Results. The results of the second experiment are shown in Table 2. The results look very similar to those of Experiment 1, with no significant differences between related groups in the two studies (two-way analysis of variance). A three-way analysis of variance was applied to this second study, using four conditions

grade-levels, and sex as variables. The only statistically significant f-ratio was for grade-levels ($F=2.66$, $df=6/56$, $p<.05$). Overall, the third-grade children again gave the lowest mean percentages of lever pushing, although in the two groups run by the black E, the fourth-grade Ss lever pushed the least. It was concluded that the same general grade-level preferences were found for black children as for whites, and that there was no effect for sex, type of reward, or color of the E.

Insert Table 2 about here

Experiment 3

This experiment employed college students as Ss.

Method. Twenty female and 20 male students were given the choice of obtaining one of two incentives, pennies or nickels, one at a time, by pushing a lever or simply by taking the coins freely from a dish. One-half of the Ss were run by a female E and one-half by a male E. Thus, each E ran 20 Ss, 10 females, five of which obtained pennies and five nickels, and 10 males, subdivided similarly. The ages of the Ss ranged from 17 to 49 years; the median age was 23 years. The apparatus and procedure were the same as in the previous studies. There was 20 choice-trials for each S.

Results. The college students did bar press in order to obtain pennies and nickels. Table 3 shows the results of this study. The preference was very slight; Ss lever pushed for 52.8% of the nickels obtained, and for 51.5% of the pennies, for a

grand mean of 52.1% of the coins obtained via the lever.

Insert Table 3 about here

A three-way analysis of variance was conducted, using Es, rewards, and sex as variables. The only significant F-ratio was for sex ($F=7.23$, $df=1/28$, $p < .05$). In fact, as can be seen in Table 3, male Ss lever pressed significantly more than females, 66.8% vs. 37.5%. The great preference of males for securing coins by lever pushing was found only when they were run by a male E. There was a slight preference in the same direction by male Ss when run by the female E. In addition, most of the difference between mean preferences of males and females was contributed by the nickel-reward condition. The age of the Ss did not correlate significantly with lever pushing, or with any other factor.

Individual differences were maximal. Both male and female students varied in their choice of response from 0 to 20 lever pushes. Nine males and two females pushed the lever on all trials, three males and four females never pushed the lever. The remaining 22 Ss divided their responses between the lever and free coins; males had a mean of 13.4 lever-pushes, females 7.5.

Experiment 4

Because of the large individual differences found in the third experiment with college students, and because of the significant sex differences, Experiment 4 was conducted which attempted to correlate certain personality variables with level of lever pushing.

Method. Forty students, 20 female and 20 male, from introductory psychology classes were again used as Ss. The Ss completed the California Psychological Inventory (CPI) in order to assess personality traits, and then were run individually in the free versus earned coin choice situation by a male E. This latter part of the study was conducted in the same manner as in the previous study. Ten males and ten females had 20 choice-trials with pennies as the reward; the other Ss obtained nickels. The CPI is composed of 480 true-false questions, approximately 200 of which appeared originally in the MMPI. The test yields 18 standard scales, divided into four categories of characteristics. The CPI requires about one hour to take.

Results. Once again, college students lever pressed for slightly more than one half of the rewards; and, again, male Ss pushed the lever significantly more than females (71% vs 41%; two-way analysis of variance, $F=5.92$, $df=1/36$, $p<.05$). There was not a significant reward effect, nor any statistically significant interactions. Therefore, it was concluded that the lever pushing data were the same as those previously obtained. The CPI test-scores were normalized, and Pearson product-moment correlations were calculated between 20 variables: 18 CPI scales, lever pushing percentages, and age of the Ss. Significant correlations between lever pushing and CPI scales for all Ss and for subsets of the data are shown in Table 4. Only two CPI scales, Social Presence and Tolerance, correlated significantly with lever pushing overall. The correlation coefficients were +.40 and +.41 respectively, both at less than the .01 level. Social Presence

is described in the CPI Manual as a measure of "poise, spontaneity, and self-confidence in personal and social interaction." Tolerance is typified by "persons with permissive, accepting, and non-judgemental social beliefs and attitudes." Social Presence and Tolerance have high positive correlations with ego strength and ego functioning of the MMPI, and high negative correlations with anxiety scales. Various other statistically significant correlations of subsets of the data and CPI scales are also presented in Table 4. No clear trends in these correlations are evident. Age did not correlate significantly with any variable.

Insert Table 4 about here

Experiment 5

Due to the fact that a significant sex difference in lever-pushing in college students was found and no such differences in preschool through sixth grade Ss were found, seventh- through twelfth-grade students were used as Ss in Experiment 5. Sixth-graders chose the lever almost 100% of the time, both males and females in Experiments 1 and 2; college students lever pressed at the 54% level in Experiments 3 and 4, males for 69% of the coins, females for 39%. Junior high (seventh- through ninth-grades) and high school (tenth- through twelfth-grades) students were run in order to determine at what grade-age the overall drop in preference appeared, and at what grade-age females and males differed in their preferences for lever pushing.

Method. Groups of 20 students, 10 males and 10 females, from each of the six grades served as Ss. They were randomly selected from white, upper-middle class schools. Ss were again run individually for 20 choice-trials, with pennies used as rewards. A female E ran five females and five males from each grade, as did a male E. The procedure was the same as in previous experiments.

Results. The results are shown in Table 5. A three-way analysis of variance was conducted using Es, sex, and grade-levels as factors. Grade-level was the only significant variable ($F=3.39$, $df=5/96$, $p<.01$). The Newman-Keuls test was applied to the grade-levels, and showed that grades 10 and 11 were significantly different at less than the .01 level, and grade 10 was significantly different from all other grades at less than the .05 level. Es, sex, and the interactions were not statistically significant. Females lever pushed slightly more than males overall, but only when run by the female E. These results are similar to those found in Experiment 3. As can be seen in Table 3, when penny-rewards were used with college students, females lever pushed more than males for the female E.

Insert Table 5 about here

Discussion and Conclusions

In the series of five studies, white Ss from preschool through college were tested in a choice situation in which rewards could be obtained freely or by lever pushing. In addition,

black children, run by a black and a white E, were used as Ss in grades kindergarten through six. Female Es only were used in grades preschool through six, male and female Es were used in grades seven through college. Pennies were used as rewards in all grades. Candies were used as rewards in grades preschool through six, and nickels were used with college students. College Ss also were administered the California Psychological Inventory to assess personality characteristics.

Nearly all of the 420 students run in the five experiments obtained some rewards by bar pressing. Overall there was a great preference for obtaining the rewards by bar pressing, more evident in younger Ss than in older ones. There appeared to be a general decrease in the percentage of rewards obtained via the lever with increasing ages. The highest percentages occurred at the first- and sixth-grades, regardless of what reward was used, or of whether the Ss or E were white or black. The lowest percentage of obtaining rewards by bar pressing occurred at the tenth-grade. Interestingly, the largest decreases in responding were at the kindergarten, seventh- and tenth-grades, the three years in which Ss had just changed schools.

The only significant sex difference was obtained in college Ss, in which males lever pushed more than females. In the college students, only two scales of the California Psychological Inventory, Social Presence and Tolerance, correlated significantly over all conditions with lever pushing.

It is concluded that bar pressing in the presence of free rewards is a fairly stable phenomenon in human Ss, particularly at earlier ages. More work needs to be done. Others have stated that it is not very surprising that animals and humans will work a manipulandum in order to secure single rewards in the presence of freely available massed, identical rewards. The results might be explained in terms of habit strength, secondary reinforcement, arousal, stimulus novelty, or environmental competence. In the work with human Ss, there do appear to be developmental trends. It is felt that some personality traits will be found that correlate highly with the phenomenon. Tarte and Klugh (1965) found that dominance was highly correlated with spontaneous alternation in humans. A similar trait - dominance, extroversion, confidence - from some assessment device probably would correlate highly with the preference for bar pressing over freeloading in humans.

Footnotes

[1]This research was supported by a research grant from the University of Nevada. The assistance of Phyllis Collier, Sharon Barber, Mark Toscher, Nancy Smith, and Ron Snyder is gratefully acknowledged. The results of Experiments 1 and 2 were reported at the meeting of the Western Psychological Association, Portland, Oregon, April, 1972; the results of Experiments 3 and 4 were reported at the meeting of the American Psychological Association, Honolulu, Hawaii, September, 1972.

[2]Requests for reprints should be sent to Robert D. Tarte, Department of Psychology, University of Nevada, Las Vegas, Nevada, 89154.

References

Carder, B., & Berkowitz, K. Rats' preference for earned in comparison with free food. Science, 1970, 167, 1273-1274.

Jensen, G. D. Preference for bar pressing over "freeloading" as a function of number of rewarded presses. Journal of Experimental Psychology, 1963, 65, 451-454.

Neuringer, A. J. Animals respond for food in the presence of free food. Science, 1969, 166, 399-401.

Neuringer, A. J. Many responses per food reward with free food present. Science, 1970, 169, 503-504.

Singh, D. Preference for bar pressing to obtain reward over freeloading in rats and children. Journal of Comparative and Physiological Psychology, 1970, 73, 320-327.

Singh, D., & Query, W. T. Preference for work over "freeloading" in children. Psychonomic Science, 1971, 24, 77-79.

Tarte, R. D., & Klugh, H. E. Alternations after forced choices as a function of dominance in women. Educational and Psychological Measurement, 1965, 25, 149-152.

Tarte, R. D., & Snyder, R. L. Barpressing in the presence of free food as a function of food deprivation. Psychonomic Science, 1972, 26, 169-170.

TABLE 1

Experiment 1 - Mean Percentages of Rewards Obtained by Lever Pushing by Grade Level - White Children

Condition	Grade Level								Totals
	Preschool	Kinder-garten	First Grade	Second Grade	Third Grade	Fourth Grade	Fifth Grade	Sixth Grade	
	Age 4	5&6	6&7	7&8	8&9	9&10	10&11	11&12	
I-candies 50 trials	100.4%	78.5%	67.0%	87.5%	57.3%	86.0%	95.0%	91.0%	83%
II-candies (eaten) 20 trials	71.1%	81.2%	77.5%	81.3%	50.7%	75.0%	51.3%	93.8%	73%
III-pennies 25 trials	100.0%	62.0%	66.0%	56.0%	52.0%	57.0%	70.0%	91.0%	69%
Totals	94%	75%	69%	78%	54%	76%	79%	92%	77%

Note: 4 S in each cell, 8 in all third grade cells.

TABLE 2

Experiment 2 - Mean Percentages of Rewards Obtained by Lever Pushing By Grade Level - Black Children

Condition	Grade Level							Totals
	Kinder-garten	First Grade	Second Grade	Third Grade	Fourth Grade	Fifth Grade	Sixth Grade	
	Age 5-6	6-7	7-8	8-9	9-10	10-11	11-12	
I-candies 25 trials Black E	94.1%	72%	100%	57%	52%	83%	100%	80%
II-candies 25 trials White E	92%	87%	87%	53%	94%	61%	100%	81%
III-pennies 25 trials Black E	80%	87%	87%	73%	68%	84%	86%	81%
IV-pennies 25 trials White E	86%	82%	87%	62%	72%	86%	92%	81%
Totals	88%	84%	90%	61%	72%	78%	94%	81%

TABLE 3

Experiment 3 - Mean Percentages of Rewards Obtained by Lever Pushing - College Students

		Female Experimenter (20 Ss)			Male Experimenter (20 Ss)				Total (40 Ss)			
		Female Ss	Male Ss	Total		Female Ss	Male Ss	Total		Female Ss	Male Ss	Total
Reward	.05	49.0	80.0	64.5	.05	14.0	68.0	41.0	.05	31.5	74.0	52.8
	.01	55.0	41.0	48.0	.01	32.0	78.0	55.0	.01	43.5	59.5	51.5
	Total	52.0	60.5	56.3	Total	23.0	73.0	48.0	Total	37.5	66.8	52.1

TABLE 4

Experiment 4 - Statistically Significant Correlations (r) Between Lever Pushing and CPI Scales (normalized data) - College Students

<table>
<tr><td colspan="4">Total - 40 Ss
Social Presence*, Tolerance*</td></tr>
<tr><td colspan="2">Males - 20 Ss
(None)</td><td colspan="2">Females - 20 Ss
(None)</td></tr>
<tr><td colspan="2">Pennies - 20 Ss
Social Presence
Socialization
Tolerance
Achievement via Conformity
Intellectual Efficiency
Femininity (-)</td><td colspan="2">Nickels - 20 Ss
(None)</td></tr>
<tr><td colspan="2">Males</td><td colspan="2">Females</td></tr>
<tr><td>Pennies - 10 Ss
Capacity for Status
Sociability*
Self-control*
Achievement via conformity</td><td>Nickels - 10 Ss
Socialization (-)</td><td>Pennies - 10 Ss
Sense of Well-being
Tolerance</td><td>Nickels - 10 Ss
Self-control (-)
Good Impression (-)
Socialization*</td></tr>
</table>

*P < .01 Level; all others P < .05
(-) Negative Correlation

TABLE 5

Experiment 5 - Mean Percentages of Rewards Obtained by Lever-Pushing by Grade Level

	Female Experimenter						
	Grade						
	7	8	9	10	11	12	Total
Female Ss	38%	61%	73%	9%	69%	49%	50%
Male Ss	64%	41%	21%	20%	43%	22%	35%
Total	51%	51%	47%	14%	56%	36%	42%

	Male Experimenter						
	Grade						
	7	8	9	10	11	12	Total
Female Ss	52%	47%	61%	27%	42%	34%	44%
Male Ss	32%	52%	52%	30%	69%	63%	50%
Total	42%	50%	56%	28%	56%	48%	47%

	Total						
	Grade						
	7	8	9	10	11	12	Total
Female Ss	45%	54%	67%	18%	56%	42%	47%
Male Ss	48%	46%	36%	25%	56%	42%	42%
Total	46%	50%	52%	22%	56%	42%	45%